ENGLISH TRANSLATION OF PCT/EP2005/010158

SPECIFICATION, CLAIMS, ABSTRACT, 3 SHEETS OF 3 FIGURES AND COVER PAGE (15 pages)

10/581894

AP3 Rec'd PCT/PTO 06 JUN 2006

SEPARATOR HAVING A CENTRIFUGAL DRUM AND A PISTON SLIDE

[00001] The invention relates to a separator having a rotatable drum with a vertical axis of rotation, in which preferably a plate stack is arranged, as well as having a piston slide for the opening and closing of solids discharge openings in the drum, in the opened condition of the piston slide, a radial gap being formed between the drum, particularly between a top part of the drum, and the piston slide.

[00002] In the case of separators of this type, which have piston slides, there is the need to reduce the occurrence of erosive phenomena in the area of the solids discharge openings, particularly evacuation slots, and to minimize the effect of the depositing of contaminations in this area.

[00003] Separators with piston slides are illustrated in German Patent Documents DE 38 03 762 A1, DE 102 20 757 A 1, DE 44 36 459 C2 and U.S. Patent Document US 5,916,083. Separators with nozzle openings are illustrated in German Patent Document DE 195 27 039 C1 and U.S. Patent Document US 290060,239.

[00004] It is an object of the invention to reduce these disadvantageous effects.

[00005] The invention achieves this task by means of the object of Claim 1.

[00006] Accordingly, at least one annular chamber is constructed on both sides of the gap radially in front of the solids discharge openings in the outer circumference area of the piston slide and the drum, particularly in the top part of the drum.

[00007] Particularly preferably, two radially successive annular chambers are constructed in the piston slide and in the top part of the drum, the two annular chambers being constructed symmetrically with respect to the contact surface of the piston slide on the top part of the drum in the closed condition. Specifically this construction causes considerably optimized flow conditions in the area of the discharge openings.

[00008] Preferably, the two annular chambers in the closed condition of the piston slide are constructed symmetrically with respect to the contact surface of the piston slide on the top part of the drum.

[00009] The radially interior annular chamber of the annular chambers is preferably constructed as a fanning-out chamber for an exiting stream of solid matter.

[00010] It is also advantageous for the radially exterior annular chamber of the annular chambers to be constructed as a swirl chamber for the exiting stream of solid matter.

[00011] The invention optimizes the flow conditions in the area in front of the solids discharge openings in a simple manner by an optimization of the geometry in the piston solid and drum elements (particularly the top part of the drum) which are connected in front of the solids discharge openings, which only results in a corresponding treatment of these elements but not in additional expenditures of material. The invention can therefore be implemented in a simple manner and minimizes not only the effect of the erosive phenomena in the area of the solids discharge openings but also reduces the tendency to form deposits. It therefore contributes to a high operative readiness of the separator and to a reduction of the necessity of cleaning operations, particularly if two annular chambers are provided which follow one another radially and are connected by way of a bottleneck.

[00012] Advantageous embodiments and further developments are indicated in the subclaims.

[00013] In the following, the device according to the invention will be explained in detail by means of an embodiment with reference of the attached drawing.

[00014] Figure 1 is a schematic sectional view of a separator; and

[00015] Figure 2 is a view of a detail of the area of a solids discharge opening on the drum of the separator when the piston slide is open; and

[00016] Figure 3 is a view of a detail from Figure 2 when the piston slide is closed.

[00017] Figure 1 is a schematic sectional view of a separator 1 with a rotatable drum 2 and a one-piece or multiple-piece non-rotatable hood 3 which surrounds the drum completely or for the most part. The drum 2 with the vertical drum axis and axis of rotation M has an intake pipe 4 extending, for example, into the drum from above. A distributor 5 is connected on the output side of the intake pipe 4, through which distributor 5 the

centrifugal material can be guided into the drum 2. A disk stack 6 of a plurality of conical disks 7 is arranged in the drum.

[00018] The removal of, here, for example, two liquid phases from the drum 2 takes place by means of two centripetal pumps or grippers 8, 9 to which outlet pipes 10, 11 are assigned.

[00019] For discharging solids accumulating in the solids space 12, a piston slide 13 is in each case used according to Figures 1 to 3, which can be operated, for example, pneumatically or hydraulically in a manner not shown here and opens up or closes solids discharge openings 14.

[00020] To this extent, Figure 1 should be understood to be purely explanatory. It does not show the further development according to the invention in the area at the solids discharge openings.

[00021] According to Figure 2, the solids discharge openings 14 are constructed as bores or slots in the bottom part 15 of the drum, which extend through the bottom part from the inside to the outside. The solids discharge openings are uniformly distributed on the circumference of the bottom part of the drum, so that webs (not visible here) remain in each case between the solids discharge openings.

[00022] In the closed condition of the drum 1, the piston slide 13 rests against the top part 16 of the drum, in which case, preferably at the lower edge of the top part 16 of the drum, a sealing ring 17 is arranged in a groove 18 in the top part 16 of the drum. In the closed condition (when the piston slide 13 is moved upward), the sealing ring 17 closes or seals off the gap between the adjoining surfaces 20, 21 of the piston slide 13 and of the top part 16 of the drum (in the embodiment according to the invention corresponding to Figure 3).

[00023] In the case of the constructions known so far, when the piston slide is open or opening, the exiting solids stream S often impacts in a narrowly focussed manner on points of the bottom part 15 of the drum, for example, on the edges of the solids discharge openings 14. This leads to erosive phenomena and deposits in the gaps between these

elements, mainly in the axial gap between the piston slide and the bottom part 15 of the drum and between the top part 16 of the drum and the bottom part 15 of the drum.

[00024] While Figure 2 illustrates the open condition of the piston slide, in which the gap 19 is formed, Figure 3 shows the closed condition. The gap width S may slightly vary in practice from one opening operation to the next. The following conditions therefore relate to a desired opening position (Figure 2) which, on average, is to be achieved by means of the piston slide. The lower surface 20 of the top part 16 of the drum represents a fixed reference plane, from which the piston slide 13 moves away during the opening.

[00025] Two radially successive annular chambers 22 and 23 respectively are constructed radially outside the sealing groove 18 in the piston slide 13 and the top part 16 of the drum in each case on both sides of the gap 19 or here symmetrically in the open condition with respect to the center plane E of the gap 19 (and in the closed condition, symmetrically with respect to the surface 20), which annular chambers 22 and 23 extend either in a surrounding manner over the entire circumference or at least in each case on the circumference over the area which corresponds with the solids discharge openings 14.

[00026] When, in the following, the interior and the exterior annular chamber 22, 23 is addressed, this applies in each case to the two interior and exterior annular chambers in the piston slide 13 and in the top part 16 of the drum.

[00027] The radially interior annular chamber 22 of the two annular chambers 22 starts just radially outside the sealing groove 18 in the top part 16 of the drum or at the corresponding point of the piston slide 13 at a kind of sharp edge 24 at a radius r1 (starting from the drum axis M - see Figure 1 - or here also measurable from the groove edge of the groove) and widens at a point r2 to a maximal axial dimension H1 ("axial" meaning in a direction parallel to the drum axis M; see Figure) and then narrows again to an axial dimension H4 at a radial point r2, to a narrowing 25.

[00028] A nozzle-type fanning-out chamber 22 is thereby created which, in the average open condition, has a radial dimension r3 - r1, which is more than twice as large as its maximal axial dimension or height H1.

[00029] In the average open condition, the axial dimension of the narrowing 24 is greater than the height or the axial dimension of the gap 19.

[00030] In the average open condition, the maximal axial dimension H1 of the fanning-out chamber 22 is smaller, preferably more than 50% smaller than the axial dimension H2 of the solids discharge openings 14 in the bottom part 15 of the drum.

[00031] As a result, the solids stream exiting through the gap 19 when the piston slide 13 is open is fanned out widely and impacts largely unbundled on the web of the bottom part of the drum. This has the purpose of minimizing as much as possible the erosion wear on the bottom part of the drum caused by the stream of solid matter.

[00032] Starting from the narrowing 25, recesses in the piston slide and drum top part 16 elements widen with an increasing radius (R; see Figure 1) to the drum axis (M) again on both sides of the gap almost in the manner of a ring with quadrant geometry to form the radially exterior annular chamber 23. However, these annular chambers widen beyond the axial dimension H2 of the solids discharge openings to an axial dimension H3 which is greater, particularly more than twice as large, than the axial dimension H2 of the solids discharge openings in the average open condition.

[00033] The annular chambers then narrow slightly again just in front of the outer radius of the piston slide, and then axially (relative to the drum axis M) on both sides of the outer edges of the solids discharge openings abut the inner circumferential wall of the bottom part 15 of the drum at the outer radius r4 at the gap between the piston slide and the bottom part 15 of the drum or between the top part 16 of the drum and the bottom part 15 of the drum.

[00034] During the exiting of the solids from the interior annular chamber 22, the solids impact at a high speed on the inner circumferential wall of the bottom part 15 of the drum, so that a portion of the exiting stream of solids is reflected back into the annular chamber 23. These particles are guided in the annular chamber 23 in the curved manner of arrows P and then exit from the solids discharge openings 14, so that a depositing of solids in the

area of these annular chambers 22, 23 and/or of the gaps between the bottom part 15 of the drum and the piston slide and the top part 15 of the drum is effectively prevented.

[00035] While, in the case of conventional separators, the exit height of the gap 19 is smaller than that of the solids discharge openings, this is reversed here.

LIST OF REFERENCE SYMBOLS

Separator	1
drum	2
hood	3
drum top part	4
intake pipe	5
distributor	6
disk stack	7
centripetal pumps	8, 9
outlet pipes	10, 11
solids space	12
piston slide	13
solids discharge openings	14
drum bottom part	15
drum top part	15 (16?)
sealing ring	17
groove	18
gap	19
surfaces	20, 21
annular chambers	22, 23
sharp edge	24
narrowing	25
radii	r1 - r4
extensions	H1 - H3
drum axis	M